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DEPARTMENT OF MINES.

MEMOIRS OF THE GEOLOGICAL SURVEY OF NEW SOUTH WALES.

C. S. WILKINSON, F.G.S., &c., GEOLOGICAL SURVEYOR-IN-CHARGE.

PALÆONTOLOGY, No. 7.

R. ETHERIDGE, JNR., PALÆONTOLOGIST.

THE MESOZOIC AND TERTIARY INSECTS

OF

NEW SOUTH WALES.

BY

R. ETHERIDGE, Junr.,

Palæontologist and Librarian to the Geological Survey of New South Wales, and Palæontologist to the Australian Museum, Sydney;

AND

A. SIDNEY OLLIFF,

Government Entomologist, New South Wales.

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1890.

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LIST OF PLATES.

Plate I.—*Cicada*, *Chironomus*, *Ephemera*, and *Palæolycus*.

Plate II.—*Mesostigmodera*, &c.

LETTER OF TRANSMITTAL.

Geological Survey Branch,
Department of Mines,
Sydney, 1 October, 1890.

Sir,

I have the honor to transmit herewith Memoir No. 7 of the *Palæontological Series* of the Geological Survey of New South Wales, on the *Mesozoic and Tertiary Insects of New South Wales*, by Mr. R. Etheridge, Junr., and Mr. A. Sidney Olliff.

It is a fact worthy of comment, as remarked by the Authors, that no discovery of Insect remains has hitherto been recorded from the Permo-Carboniferous Coal Measures of Australia, the fine-grained clay shales and ironstones of which should be eminently fitted for the preservation of such delicate organisms.

This, however, is probably attributable rather to the want of systematic search for such fossils than to their non-existence. The abundance of fossil wood and various plants in the Permo-Carboniferous Coal Measures of New South Wales, and the occurrence in the latter, as at Awaba, near Newcastle, of the fossil remains of extensive coniferous forests, render the co-existence of insect life with this flora more than probable. The recent important discoveries of fossil Insects by Mr. J. H. Simmonds, of Brisbane, in the Ipswich Coal Measures, prove that insect life had already attained some considerable development in the early portion of the Mesozoic Era in Queensland.

The fossil Insects described in the accompanying Memoir are from at least two widely distinct geological horizons. *Cicada? Lowei* is from the *Tæniopteris*-bearing beds of the Talbragar River in New South Wales, and probably of Lower Mesozoic age. The fossil Insects from the Ipswich Coal Measures of Queensland are probably referable to about the same geological period as the former, as evidenced by the similarity of the fossil floras with which they are respectively associated.

The remainder of the specimens described were obtained by Mr. C. S. Wilkinson, F.G.S., and myself, when examining, geologically, the Vegetable Creek District. The specimens were collected by a local miner, Mr. T. Smith, from a deposit of stream-tin which he was working near Emmaville, known as *Fox and Partridge's Shallow Lead.* A careful stratigraphical examination of this bed convinced me that it belonged to the youngest of the Tertiary stanniferous leads developed in this neighbourhood. The earthy ironstone, in which the fossil impressions are preserved, has evidently been formed in water, after the manner of recent bog-iron ores, the iron having been derived from the basalts and laterites of early Tertiary lavas, through which the channel of *Fox and Partridge's Shallow Lead* was eroded.

The evidence as to the downward limit of the geological age of this insect-bearing ironstone is based partly on the associated fossil flora, and partly on the relation of this flora to an earlier flora, which Baron Constantin von Ettingshausen considers to belong to the Eocene Period. Some estimate of the extent of geological time which intervened between these two floras may be formed from the following facts:—

(1) In the first place, the white clays of Rose Valley, near Emmaville, which contain the Eocene Flora, were buried under a sheet of basalt lava 100 feet thick. This sheet was subsequently eroded, probably entirely by fresh water, to a depth of not less than 40 feet. This second channel was then inundated by a second flow of lava, which consolidated into a sheet also 100 feet thick in places. A third channel was then excavated, also probably by the action of fresh water, through the second sheet of lava to a depth of from 30 to 60 feet.*

The shaly-ironstone, in which the fossil-insect impressions are now found, was then formed at the bottom and sides of probably this third channel. There is, however, no certain proof that this ironstone reposes on, and is consequently newer than, the second basalt sheet, though the general stratigraphical evidence strongly favours this supposition.

(2) As regards the upward limit of the geological age of the insect-bearing ironstone of Emmaville, it may be stated that the channel on the sides of which it rests is clearly part of the Tertiary drainage

* *Vide.*—Section No. 2, C—D, Fox's Shaft, at end of Geology of the Vegetable Creek Tin-mining Field, by T. W. Edgeworth David, B.A.

system, as its fall is in an exactly opposite direction to that of the existing creeks, and having been long since silted up, it now actually forms part of a spur dividing the watersheds of some small tributaries of the present Vegetable Creek.

The considerable alteration, therefore, which the physical features of the locality have undergone since the extinction of the channel in which the Insect remains were buried justifies the date of this deposit being referred provisionally to some part of the Tertiary Era, perhaps to its earlier period, as the authors suggest.

I have the honour to be,
Sir,
Your obedient servant,
T. W. EDGEWORTH DAVID, B.A.,
Acting Geological Surveyor-in-Charge.

HARRIE WOOD, ESQ., J.P.,
Under Secretary for Mines.

Author's Preface.

The Insect remains about to be described are derived from three sources. The N. S. Wales specimens, with the exception of one species, were collected by Mr. C. S. Wilkinson, F.G.S., &c., the Geological Surveyor-in-Charge, and by Mr. T. W. Edgeworth David, B.A., Geological Surveyor, during the latter's survey of the Vegetable Creek Tin-field, and are of Tertiary age. The single specimen was obtained by Mr. Charles Cullen, Collector to the Geological Survey, from the Mesozoic beds of the Talbragar River. The Insect remains from Queensland were kindly lent to us by Mr. T. H. Simmonds, of Brisbane.

The fragmentary nature of the remains and their film-like appearance have rendered determination difficult, but the identifications we have ventured to make are probably but little removed from accuracy.

The Systematic Descriptions are preceded by an Introduction, in which the, so far, brief history of Australian Fossil Insects is placed before the reader.

R. ETHERIDGE, Jnr.
A. SIDNEY OLLIFF.

Sydney, October, 1890.

I.—INTRODUCTION.

THE Palæozoic rocks of Australia have hitherto failed to yield any trace of Insect life. This is the more remarkable when we remember the very great extent of the Permo-Carboniferous Coal Measures of Eastern, and probably also Western Australia, and Tasmania, containing sediments eminently fitted for the preservation of Insect remains.

Until recently the oldest-known Insect in the rocks of this Continent was a Libelluloid wing from the Cretaceous beds of the Flinders River, Central Queensland, described by Dr. Henry Woodward* as *Æschna flindersensis*. This interesting and unique specimen was obtained by Mr. R. L. Jack, Queensland Government Geologist, about seven miles above Marathon Station, on the river named, and is contained in a dark-chocolate limestone, associated with *Aucella hughendensis*, Etheridge, a bivalve very characteristic of that part of the Queensland Cretaceous Series.

On this wing Dr. Woodward makes the following remarks:—"The very imperfect state of our specimen precludes our correlating it with confidence to any living genus, but sufficient is preserved to demonstrate that it is the posterior wing of a Neuropterous insect of the sub-order *Odonata*, Fabr., and perhaps referable to the sub-family *Gomphinæ*, one genus of which, *Austragomphus*, de Selys, having five species, is characteristic of Australia and Tasmania."

Dr. Woodward finds its nearest prototype in the wing of a Libelluloid insect from the fresh-water Purbeck Limestone of Durdlestone Bay, near Swanage, Dorset, England.

The only other remains previously known from an Australian locality are of Tertiary age, and were described by the late Mr. Charles Moore,† of Bath, England, from the Broken River, at Sydney Flat, near Uralla.

The insects were obtained from a chocolate-coloured, micaceous, laminated marl, forming a bed ten feet thick, at a depth of about one hundred feet from the surface, and forming a portion of the Tertiary drifts worked at the above locality. The latter are probably of Pliocene age.

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* Geol. Mag., 1884, I, p. 337, t. 11, f. 1.

† "Note on a Plant and Insect Bed on the Rocky River, New South Wales," Quart. Journ. Geol. Soc., 1870, XXVI, p. 261.

On these remains Mr. Moore made the following remarks:—"The first which attracted my attention was a small, black, shining, highly ornamented elytron of a beetle, partly concealed in the matrix . . . Ten other insects were afterwards obtained from the same block. The most abundant belong to the Coleoptera, both double and single elytra being present, some of them having the punctate striæ well preserved; there are single specimens which may belong to *Cyphon*, and also a minute annulose body which may be a larva"* In the explanation of the plate accompanying his paper, Mr. Moore also recorded a larva, "probably of *Oxytelus*," and an insect "probably allied to *Cydnus*."

These fossils were referred to by Mr. S. H. Scudder in Zittel's *Handbuch der Paleontologie.* He remarked that the *Cydnus* was the fifth Tertiary species known, the others occurring at Œningen, Aix, and in the Wyoming Territory.† The family (Cydnidæ) was thus tolerably abundant, varied, and widespread during Tertiary times. The remains of *Cyphon*, representing the family Dascyllidæ, have also been met with in the Prussian Amber deposits.‡ *Oxytelus*, a genus of Staphylinidæ, is known from the Tertiary of Œningen and Utah,§ and the larva so named by Moore, Mr. Scudder believes to be correctly identified.‖ Touching Moore's other figures, we would remark that his Pl. XVIII, Fig. 7–9, are certainly Rhynchophora, perhaps Amycteridæ, a family characteristic of the recent fauna of Australia. Fig. 2 of the same plate may possibly be a *Lagria*, but the remaining figures are undeterminable.

The single Mesozoic species from New South Wales, hereinafter described as *Cicada? Lowei*, was obtained by Mr. Cullen, with a fine collection of fish and plant remains, from near the Talbragar River, about twenty miles north of Home Rule Township, between Mudgee and Gulgong. The exact position is marked bythe southern boundary of Boyce's Selection, No. 14, Parish of Bligh, County Bligh, and the deposit was originally discovered by Mr. Arthur Lowe, of Wilbertree, Mudgee, by whom the counterpart of the specimen has been kindly lent. Mr. W. Anderson, Geological Surveyor, who has surveyed the locality, thus writes of the beds exposed there:¶—"The shales in which

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* *Loc. cit.*, p. 263.
† *Ibid*, II Band, p. 786.
‡ *Loc. cit.*, p. 798.
§ *Loc. cit.*, p. 801.
‖ See also Mr. Scudder's article—"Systematic Review of our Present Knowledge of Fossil Insects, &c." Bull. U.S. Geol. Survey, 1886, V, No. 31, pp. 64, 78, and 80.
¶ Rec. Geol. Survey N. S. Wales, 1889, I, Pt. 2, p. 138.

the fossils occur are thinly laminated, fine-grained, and ferruginous. When unweathered they are grey in colour, and when weathered light brown, which is due to the decomposition of the contained ferruginous material. . . . . The results of the weathering of these shales are somewhat peculiar. When fresh the rock appears to be quite compact, without any visible sign of jointing or lamination; but immediately the weathering action begins, it first picks out the vertical jointing, along which the ferruginous decomposition travels, and from there it passes along the laminæ, and so gradually diffuses itself throughout the rock. . . . . After considerable weathering it splits easily into square or rectangular layers, often very thin. . . . . This discolouration which the rock undergoes does not materially affect the fossils, which are sometimes of a white colour." The fish and plant remains are very plentiful, but those of insects equally rare.

Of the age of this deposit Mr. Anderson says:—"After a careful examination of the ground, I am inclined to think that what little stratigraphical evidence there is points to the conclusion that they form an isolated lenticular patch in the horizontally-bedded sandstones, similar to the lenticular beds of grey shale which occur in the Hawkesbury Sandstone near the coast. If this be so, the fish, plant, and insect remains are of Hawkesbury or Triassic age, and, consequently, they belong to the same period as the large collection of fish which was obtained some time ago at Gosford,* on the Northern Railway, between Sydney and Newcastle."† The fish are at present in the hands of Mr. A. S. Woodward, of the Natural History Museum, London, who recently wrote to one of the Authors that they were specifically distinct from those referred to by Mr. Anderson as found at Gosford. A preliminary examination of the plants has been made, with the following results. They "are of the highest possible interest, as indicating an alliance of these rocks with those of the Clarence Series of New South Wales, the Ipswich Series of Queensland, and the Wannon and Bellarine beds of Victoria. The most conspicuous plant is a *Tæniopteris*, which Professor M'Coy is unable to distinguish from his *T. Daintreei*, so characteristic of the Mesozoic deposits of Victoria."‡ It is exceedingly probable, therefore, that, although of Lower Mesozoic age, the beds containing the Talbragar fossils will be found to be higher, stratigraphically, than the Gosford fish-bed.

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* The Fossil Fish of the Hawkesbury Series at Gosford. By A. S. Woodward, Mem. Geol. Survey, N. S. Wales (Pal. Series), No. 4, 1890.

† *Loc. cit.*, p. 139.

‡ Etheridge, Ann. Report Dept. Mines, N. S. Wales for 1889 [1890], p. 287.

For our knowledge of additional Queensland Mesozoic Insects we are indebted to the zealous researches of Mr. J. H. Simmonds, of Brisbane, who has obtained a small series of decorticated examples, and their impressions, from the Ipswich Coal Measures. These include a member of the Coleopterous family Buprestidæ, which we have described under the name of *Mesostigmodera typica*, thereby indicating its relation to the recent *Stigmodera*, a widely-distributed and characteristic Australian genus, of which many species are exceedingly well marked by the peculiar ornamentation of the elytra. The other remains are fragmentary, but, with one exception, they appear to be those of Coleoptera also. Two of the elytra we believe to be referable to the Rhynchophora; two others possibly represent the family Hydrophilidæ; whilst the fifth may be a portion of a larva, possibly of one of the Lampyridæ. The exception above referred to is the impression of the abdomen of one of the larger Hemiptera.

The Tertiary insects collected by Mr. C. S. Wilkinson, and by Mr. T. W. Edgeworth David during the latter's survey of the Vegetable Creek Tinfield, are from the youngest Tertiary stanniferous lead of the district. They are referred to in his valuable work, *The Geology of the Vegetable Creek Tin-mining Field, New England District.** Mr. David states that "impressions of fossil Insects have been found on Red Hill, near Emmaville, the markings being plainly visible in fine brown earthy ironstone, but these belong to the latter part of the Tertiary volcanic epoch." The relation of the leads at Vegetable Creek, one to the other, is excellently shown in Section No. 2 of the work quoted, the fossils being from the lead penetrated by "Fox's Old Shaft."

Baron Constantin von Ettingshausen, Professor of Botany in the University of Graz, Austria, has described† the plants of Vegetable Creek generally as Eocene. As a matter of fact, however, the specimens were collected from at least two distinct horizons, representing the youngest and oldest of the leads.‡ As before stated, the Insect remains were obtained from the youngest lead, and may be regarded as of younger Tertiary age, at any rate much younger than the plant remains from the oldest lead.

The following descriptive remarks on the locality of the fossils were made by one of the Authors in an Appendix to Baron Ettingshausen's work:§—"The leaves obtained at Fox and Partridge's are from a shallow

* Mem. Geol. Survey, N. S. Wales (Geol. Series), 1887, No. 1 (4to. Sydney, 1887, by Authority), p. 60.
† "Contributions to the Tertiary Flora of Australia," Mem. Geol. Survey N. S. Wales (Pal. Series), 1888, No. 2.
‡ See Stratigraphical Note by R. Etheridge, jun., in *Ibid.*, p. 182.
§ *Loc. cit.*, p. 187.

lead forming a part of the newer series of leads between the Rose Valley and the Red Hill, two miles from Emmaville. The matrix is a shaly-ironstone, reposing in an old valley on the denuded sides of the older and newer basalt, perhaps even entirely on the former. The depth of sinking varied from thirty to fifty feet, the strata passed through being a mixture of volcanic dust, clay, and sand. The plant remains were accompanied by those of insects, some of the specimens being in a fair state of preservation." The flora of this deposit is as follows:—

Taxineæ .....Ginkgocladus australiensis, *Ett.*
Myriceæ .....Myrica Koninckı, *Ett.*
Betulaceæ .....Alnus Maccoyi, *Ett.*
Monimiaceæ .....Hedycarya Wickhami, *Ett.*
Laurineæ .....Laurus australiensis, *Ett.*
Proteaceæ .....Lomatia Finnisii, *Ett.*
„ Goyderi, *Ett.*
Myrsineæ .....Myrsine Stokesii, *Ett.*
Sapindaceæ.....Sapindus Gossei, *Ett.*
Celastrineæ .....Elæodendron subdegener, *Ett.*
Ilicineæ .....Ilex macleayana, *Ett.*
Diosmeæ .....Boronia Harrisii, *Ett.*
„ Hookeri, *Ett.*
Myrtaceæ .....Eucalyptus Mitchelli, *Ett.*
Callistemophyllum Hackii, *Ett.*
„ Swindeni, *Ett.*

We are not aware that any other notices of Australian Fossil Insects have appeared, with the exception of a record by Mr. C. S. Wilkinson, Government Geologist, who, in exhibiting specimens at a meeting of the Linnean Society of New South Wales,* stated that they were "found in the tin-bearing Tertiary deep leads near Vegetable Creek, New England," and that "the specimens show the impressions of larvæ and pupæ of *Ephemera*, or May-fly." This record has not been overlooked in Mr. S. H. Scudder's "Review of Fossil Insects," as it is there mentioned that "Wilkinson has also found a species [of *Ephemera*] in Australia."† These Vegetable Creek Insects, it may be added, are a portion of the material here dealt with.

In addition to those about to be described, we have observed what we believe to be the remains of an aculeate hymenopteron, and a beetle with striated elytra, but the fossils are much too indefinite for description.

* Proc. Linn. Soc. N. S. Wales, 1883, VIII, p. 398.
† Bull. U. S. Geol. Survey, 1886, V, No. 31, p. 54.

II.—DESCRIPTION OF THE SPECIES.

Order—**RHYNCHOTA.**

Sub-order—**HOMOPTERA.**

Family—*CICADIDÆ.*

Genus—CICADA, *Linnæus.*

CICADA ? LOWEI, *sp. nov.*

Plate I, Fig. 1.

Sp. Char.—Elongate, moderately robust, the three divisions of the body—head, thorax, and abdomen—very distinct; head rather large and broad, with a lateral tuft of setæ on each side at the base; no antennæ, rostrum, eyes, or ocelli visible; thorax longer than broad, truncate both before and behind, the sides rounded; abdomen nearly one-half longer than the head and thorax together, slightly constricted at the base, narrowed posteriorly, with seven distinct segments of nearly equal length; wings ample, rather narrow, reaching considerably beyond the extremity of the body, evidently hyaline; fore-wing with the costa slightly arcuate, rounded at the extremity, the venation chiefly longitudinal, a hind-marginal vein unites the longitudinal veins, and cross-veins divide the apical from the basal area of the wing at a point about its middle; hind-wing much shorter than fore-wing. Length, 16 mm.; length of fore-wing, 14 mm.; greatest width of abdomen (at second segment), 5 mm.

Obs.—This fossil is provisionally referred to the Cicadidæ, as its general form and the plan of the venation of its fore-wings, as far as can be judged from the limited material at our disposal, seem to forbid its inclusion in any other family. The presence of a marginal vein uniting the longitudinal veins at the extremity of the fore-wings, and the fact that cross-veins exist near the middle of the wings—serving, it seems to us, as an indication of the point where the ulnar and apical areas may be distinguished—are characters which give strong support to this view; and there is additional evidence in the structure of the thorax, inasmuch that it presents two conspicuous divisions corresponding to the pronotum and mesonotum. But, in

spite of these characters, the absence of opercula, and the fact that neither the head nor the limbs are preserved in our fossil, or its impression, render any definite determination impossible. When further specimens are brought to light, and not till then, can we expect a more satisfactory conclusion.

Cicada? Lowei is the only insect so far known from the Mesozoic rocks of New South Wales, and, with the exception of *Æschna flindersensis*, and those about to be described, from Australia generally. Its occurrence in the geological sequence is of particular interest, from the important part played by the family in the existing Insect-fauna of the Continent.

Cicadidæ have been described from the Lias of England and Germany, and the Upper Oolite of the former country, but Scudder refers to these in very doubtful terms. They are abundant in Tertiary rocks.

Locality and Horizon.—Southern boundary of Boyce's Selection, No. 14, Parish of Bligh, County Bligh. Lower Mesozoic (*Messrs. A. Lowe and C. Cullen.*)

Order—**DIPTERA.**

Sub-order—**ORTHORHAPHA.**

Family—CHIRONOMIDÆ.

Genus—CHIRONOMUS, *Meigen.*

CHIRONOMUS VENERABILIS, *sp. nov.*

Plate I, Fig. 2.

Sp. Char.—Antennæ small, thread-like; head rounded; the eyes separated; thorax rather large, elongate-ovate, more or less projecting anteriorly; wings elongate, slender; halteres very short; abdomen elongate, about twice the length of the body, moderately robust, composed of eight segments; lamellæ of ovipositor very small and narrow; legs long and slender, the femora a little longer than the tibiæ. Length, $4\frac{1}{3}$ mm.

Obs.—Although these remains are in a very imperfect state there is enough to prove conclusively that they represent a species of Midge belonging to the Chironomidæ, one of the largest and most widely-distributed families of Nematocerous Diptera, many species of which, like the May-flies with which

these fossils are associated, dwell in water in the larval and pupal conditions; and it is in such localities, near running streams and fresh-water pools, that the perfect insects are found in the greatest numbers.

From what can be seen of the antennæ and the abdominal appendages the specimen appears to be a female. Unfortunately the venation, one of the most important characteristics in the classification of the Diptera, is wholly imperceptible.

Chironomidæ appear to have been abundant in Mesozoic and Tertiary times, as a number of fossil forms are known from various formations, including one described from the Lias by Geinitz, some described by the Rev. P. B. Brodie from the Purbeck Series, and others by Dr. Oswald Heer from the Tertiary rocks of Oeningen.

Locality and Horizon.—Fox and Partridge's claim, Red Hill, near Emmaville, New England. Youngest Tertiary stanniferous lead of the Vegetable Creek, Tin-field; Upper Tertiary (*Mr. T. W. Edgeworth David.*)

Order—NEUROPTERA.

Family—EPHEMERIDÆ.

Genus—EPHEMERA, *Linnæus.*

EPHEMERA CULLENI, *sp. nov.*

Plate I, Figs. 3–9.

Sp. Char.—Adult: Elongate, moderately robust, somewhat narrowed behind; head rather large; eyes large, prominent, and approximate; antennæ subulate, very small; thorax robust; mesothorax predominant; fore-wing oblong, trilateral, rounded at the extremity, the venation fine and reticulate; the costal margin slightly curved, rather more than one and a half times the length of the hind margin; abdomen much longer than the head and thorax together, slightly narrowed posteriorly, furnished at the hinder extremity with three many-jointed filiform tails or caudal setæ; legs rather long; the femora robust; the tibiæ slender, rather longer than the femora; tarsi small. Length of body, 10 mm.; of wing, 10 mm.

Nymph similar to the adult insect, but with the head broader and the wings rudimentary; no tracheal branchiæ observable.

Obs.—There can be no doubt as to the position of this fossil, as the structure of the limbs and caudal appendages, to say nothing of the general *facies*, clearly indicate its Ephemerid nature. The fore-wing, which is preserved in only one specimen, although presenting the reticulated venation characteristic of the family, is somewhat peculiar in shape, inasmuch that the inner angle of the hind margin is very widely removed from the base. In this respect it is approached by certain species of the genus *Siphlurus*. According to Mr. Scudder,* the Ephemeridæ are undoubtedly represented in the Oolite of Solenhofen, and the Siberian Jurassic rocks. The family is also represented in Continental Tertiary deposits, and figures largely in amber inclusions.

Locality and Horizon.—Fox and Partridge's claim, Red Hill, near Emmaville, New England. Youngest Tertiary stanniferous lead of the Vegetable Creek Tin-field; Upper Tertiary (*Mr. T. W. Edgeworth David.*)

Order—**COLEOPTERA.**

Sub-order—**SERRICORNIA.**

Family—BUPRESTIDÆ.

Genus—MESOSTIGMODERA, *gen. nov.*

MESOSTIGMODERA TYPICA, *sp. nov.*

Plate II, Figs. 1-3.

Sp. Char.—Elytra elongate, rather strongly convex, slightly impressed in the middle at the base, the outer margin narrow, moderately reflexed, and arcuately narrowed posteriorly from the apical two-thirds; the apex obtuse, slightly produced, and without terminal teeth or spines; the suture slightly elevated; the whole surface of the wing is covered with very regular rows of large shallow pits or punctures which extend from the base to the apex, the interstices moderately broad, and closely covered throughout their entire length with very small elevations or tubercles; these elevations are irregularly arranged, those towards the base becoming a trifle larger in size, and somewhat more conspicuous; each of the large punctures of the longitudinal series is surrounded by five or six of these elevations, and the space between the suture and the sutural line is provided with two irregular longitudinal rows of similar elevations; the shoulder very slightly prominent; the margin impunctate and moderately broad. Length, 12 mm.; greatest width, 4 mm.

* Bull. U. S. Geol. Survey, 1886, V, No. 31, p. 54.

Obs.—The remarkable character of the ornamentation, or sculpture, of this wing will at once distinguish it from the various genera of the family Buprestidæ, both recent and fossil, and from the allied families Elateridæ and Eucnemidæ; indeed, we cannot recall at this moment a single genus throughout the whole Coleopterous order in which the ordinary punctate-striate sculpture, consisting of distinct punctures arranged in regular series one behind another, is combined with small irregularly-disposed elevations. Its form and structure clearly indicate that it belongs to the Buprestidæ, and there is little doubt, we think, of its affinity to that type of the recent genus *Stigmodera* (e.g., *S. gratiosa*, Chev., *S. Roei*, Hope, &c.), which prevails in West and South Australia. The type of which we speak is represented in New South Wales by one or two species, and it is to one of these, the *Stigmodera sanguinosa*, Hope, that the fossil wing appears to be most nearly allied. The peculiar punctuation seems to indicate that this insect belongs to a very ancient type, and an examination of the specimen suggests the possibility that the ordinary rugose form of sculpture, accompanied by deep pits, now so prevalent amongst the Buprestidæ, may, so far as the Australian species are concerned, have been derived from this older type.

Various other Insect remains were found in this Ipswich deposit, but none of them are in a sufficiently good state of preservation to admit of accurate determination. With one exception they are certainly the remains of Coleoptera, and several of them bear a superficial resemblance to the remains described by Mr. Charles Moore from Sydney Flat. Of these, two well-preserved elytra are certainly referable to the Rhynchophora (Pl. II. Figs. 4 and 5), and one of them, measuring 3 mm. in length, is evidently related to *Gonipterus*, or its immediate allies. It has the whole surface of the wing minutely and regularly tuberculate, a strongly-raised suture, and a very decided lateral ridge extending from the shoulder to the apex. Two other fossils, exhibiting the thorax and elytra, are probably representatives of the family Hydrophilidæ (Pl. II. Figs. 6 and 7); both of them have the wing-cases punctate-striate, and in one the segmentation of the abdomen is clearly shown. A fifth specimen appears to be the head and prothoracic segment of a Coleopterous larva (Pl. II. Fig. 8), possibly of one of the Lamprinidæ, but in the absence of further material it is not judicious to venture a decided opinion. The only other specimen which has so far been found appears to be the impression of the abdomen of one of the larger Hemiptera (Pl. II. Figs. 9 and 10).

Locality and Horizon.—Denmark Hill, Ipswich, Queensland. Ipswich Coal Measures, Lower Mesozoic, associated with *Estheria*, and a copious flora (*Mr. J. H. Simmonds*—Collection Simmonds, Brisbane.)

Sub-order—MALACODERMATA.

Family—*LAMPYRIDÆ.*

Genus—PALÆOLYCUS, *gen. nov.*

PALÆOLYCUS PROBLEMATICUS, *sp. nov.*

Plate I, Figs. 10–14.

Sp. Char.—Larva: Elongate, narrow; head narrowed in front, small, evidently corneous, with two longitudinal sulci; antennæ minute, jointed, inserted near the anterior angle of the head; thoracic and abdominal segments similar in form, the latter nine in number; the terminal segment furnished with a bifid tail. Length, 26–28 mm.; greatest width, $1\frac{3}{4}$ mm.

Obs.—The possession of a corneous head with jointed appendages, a bifid tail, and uniform thoracic and body segments, through which the alimentary canal can be plainly seen, mark these remains as those of some Colcopterous insect, and there seems every probability of their near affinity to the genus *Lycus*, to the larvæ of which they bear a striking resemblance.

The frequency with which this larva occurs on the pieces of shale from Vegetable Creek renders more than a passing recognition necessary. Acting on this belief, we venture to propose the above name for its reception, both as an index to the formation in which it occurs, and with the view of calling the attention of collectors to it. By this means, perhaps, other specimens may be obtained, throwing a further light on its affinities.

Lampyridæ are known from the Lias, and, according to Scudder, the family is moderately abundant in the Tertiaries.

Locality and Horizon.—Fox and Partridge's claim, Red Hill, near Emmaville, New England. Youngest Tertiary stanniferous lead of the Vegetable Creek Tin-field; Upper Tertiary (*Mr. T. W. Edgeworth David.*)

III.—TABULAR VIEW OF AUSTRALIAN FOSSIL INSECTS, SO FAR AS KNOWN.

Order, Family, Genus, and Species.	Lower Mesozoic.	Cretaceous.	Younger Tertiary.
Order—RHYNCHOTA.			
Family—**CICADIDÆ.**			
Cicada? Lowei, *E. and O.*	×	.....	.....
Family—**CYDNIDÆ.**			
Cydnus, *sp.*	.....	.....	×
Order—DIPTERA.			
Family—**CHIRONOMIDÆ.**			
Chironomus venerabilis, *E. and O.*	.....	.....	×
Order—NEUROPTERA.			
Family—**EPHEMERIDÆ.**			
Ephemera Culleni, *E. and O.*	.....	.....	×
Family—**LIBELLULIDÆ.**			
Æschna flindersensis, *H. Woodw.*	.....	×	.....
Order—COLEOPTERA.			
Family—**LAGRIIDÆ.**			
Lagria? *sp.*	.....	.....	×
Family—**LAMPYRIDÆ.**			
Palæolycus problematicus, *E. and O.*	.....	.....	×
Family—**DASCYLLIDÆ.**			
Cyphon, *sp.*	.....	.....	×
Family—**STAPHYLINIDÆ.**			
Oxytelus, *sp.*	.....	.....	×
Family—**BUPRESTIDÆ.**			
Mesostigmodera typica, *E. and O.*	×	.....	.....

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Chironomus	7
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Cicada ?	6
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„ Culleni	8
Mesostigmodera	9
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„ problematicus...	11

PLATE I.

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Fig. 1. *Cicada (?) Lowei*, E. and O.; a partially-preserved individual seen from above, x 3. Lower Mesozoic beds, Talbragar River 6

Fig. 2. *Chironomus venerabilis*, E. and O.; a partially-preserved individual with one wing remaining, x 3. Upper Tertiary, Vegetable Creek 7

Fig. 3. *Ephemera Cullenì*, E. and O. A nymph seen partially from the side, showing eyes, rudimentary wing, legs, and abdominal segments, x 3. Upper Tertiary, Vegetable Creek 8

Fig. 4. Ditto; showing head, eyes, thorax, limbs, and abdomen, with imperfect caudal setæ, seen from above, x 3. Upper Tertiary, Vegetable Creek.

Fig. 5. Ditto; adult seen from above, with one of the fore-wings preserved, and portions of the caudal setæ, x 3. Upper Tertiary Vegetable Creek.

Fig. 6. Ditto; another nymph seen from above, with legs preserved, x 3. Upper Tertiary, Vegetable Creek.

Fig. 7. Ditto; a nymph in which the abdominal segments are well preserved, x 3. Upper Tertiary, Vegetable Creek.

Fig. 8. Ditto; a fairly perfect example in which the caudal setæ appear preserved in their entirety, x 4. Upper Tertiary, Vegetable Creek.

Fig. 9. Ditto; a rather distorted example, x 3. Upper Tertiary, Vegetable Creek.

Fig. 10. *Palæolycus problematicus*, E. and O.; a specimen in which the alimentary canal is preserved, but the bifid tail absent, x 2. Upper Tertiary, Vegetable Creek 11

Fig. 11. Ditto; alimentary canal partially preserved, the antennæ and bifid tail in position, x 2. Upper Tertiary, Vegetable Creek.

Fig. 12. Ditto; an individual in which the antennæ, alimentary canal, segmentation of the body, and tail are preserved, x 2. Upper Tertiary, Vegetable Creek.

Fig. 13. Ditto; another in which the segmentation is faintly visible, x 3. Upper Tertiary, Vegetable Creek.

Fig. 14. Ditto; a specimen in which the bifid tail has become twisted, x 2. Upper Tertiary, Vegetable Creek.

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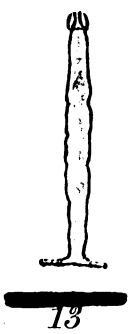
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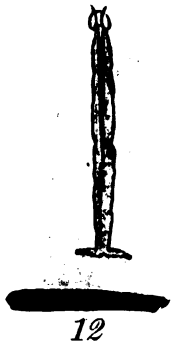
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PLATE II.

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Fig. 1. *Mesostigmodera typica*, E. and O.; impression of an elytron, showing shallow pits. x 4. Lower Mesozoic, Ipswich Coal-field 9

Fig. 2. Ditto; cast of Fig. 1, showing elevations corresponding to the pits of that specimen and intermediate punctures. x 4. Lower Mesozoic, Ipswich Coal-field.

Fig. 3. Ditto; portion of the surface of Fig. 2, highly magnified.

Fig. 4. Elytron of Rhynchophorous Beetle, perhaps related to *Glochinorrhinus*. x 12. Lower Mesozoic, Ipswich Coal-field 10

Fig. 5. Elytron of another Rhynchophorous Beetle. x 12. Lower Mesozoic, Ipswich Coal-field 10

Fig. 6. Prothorax and elytra of a Beetle, probably of the family Hydrophilidæ. x 9. Lower Mesozoic, Ipswich Coal-field 10

Fig. 7. Similar portions of another Beetle of the same family, but probably of a different genus. x 6. Lower Mesozoic, Ipswich Coal-field 10

Fig. 8. Head and prothoracic segment of a Coleopterous larva, possibly of the family Lampyridæ. x 4. Lower Mesozoic, Ipswich Coal-field 10

Fig. 9. Cast of the abdomen of one of the larger Hemiptera. x 4. Lower Mesozoic. Ipswich Coal-field 10

Fig. 10. Impression of the same specimen. x 4.

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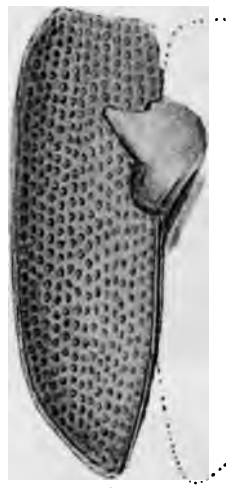

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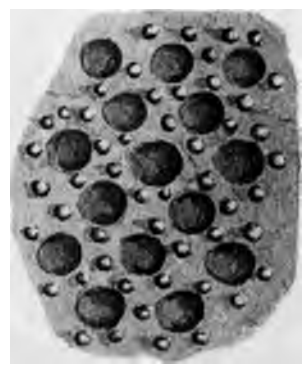

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